



# NASA Procedural Requirements

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## NASA Enterprise Architecture Procedures

**Responsible Office: Office of the Chief Information Officer**

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# Preface

## P.1 Purpose

- a. The NASA Procedural Requirements (NPR) 2830.1 outlines and defines the NASA Enterprise Architecture (EA) Program for Information Technology (IT). The primary purpose of EA is to align all aspects of NASA's business, financial, scientific, and engineering needs with technology infrastructure and resources to improve the performance of IT and support NASA's Mission. EA will enhance NASA's IT governance structure through a defined enterprise process designed to develop and maintain an integrated IT roadmap that allows the Agency's governance boards to make informed investment and management decisions.
- b. This NPR includes the EA processes, products and outcomes, roles and responsibilities, and procedural requirements and governance required by the Clinger-Cohen Act and OMB A-130, under the authority of NPD 2830.1, to achieve this purpose.

## P.2 Applicability

- a. This NPR is applicable to NASA Headquarters and NASA Centers, including Component Facilities and Technical and Service Support Centers. This language applies to Jet Propulsion Laboratory (JPL), a Federally Funded Research and Development Center (FFRDC), contractors, grant recipients, or parties to agreements, but only to the extent specified or referenced in the appropriate contracts, grants, or agreements.
- b. In this directive, all mandatory actions (i.e., requirements) are denoted by statements containing the term "shall." The terms "may" or "can" denote discretionary privilege or permission, "should" denotes a good practice and is recommended but not required, "will" denotes expected outcome, and "are/is" denotes descriptive material.
- c. In this directive, "NASA charters" refers to those charters that govern councils, boards, committees, panels, and working groups with Agency-wide membership.
- d. In this NPR, "Center-level charters" refers to those charters that govern councils, boards, committees, panels, and working groups with Center-specific membership.

## P.3 Authority

- a. 40 U.S.C. 11101 et seq., Clinger-Cohen Act of 1996, also known as the Information Technology Management Reform Act (ITMRA), as amended
- b. Office of Management and Budget (OMB) Circular No. A-130 Revised - Management of Federal Information Resources
- c. NPD 2830.1 - NASA Enterprise Architecture

## P.4 Applicable Documents and Forms

- a. Circular A-11 - Preparation, Submission, and Execution of the Budget
- b. Circular A-130 Revised - Management of Federal Information Resources
- a. Information Resources Management (IRM) Strategic Plan
- b. NPD 1001.0 - NASA Strategic Plan
- c. NPD 2830.1 - NASA Enterprise Architecture
- d. NPR 1441.1 - NASA Records Retention Schedules
- e. NPR 2800.1B - Managing Information Technology
- f. NPR 7120.7 - NASA Information Technology and Institutional Infrastructure Program and Project Management Requirements
- g. NPR 8000.4A - Agency Risk Management Procedural Requirements
- h. NPR 9420.1 - NASA Budget Formulation
- i. OMB (M-12-10, M-13-09) - PortfolioStat
- j. The Common Approach to Federal Enterprise Architecture (OMB, 05/02/2012)

## **P.5 Measurement/Verification**

- a. NASA EA effectiveness will be measured based on the results of IT implementations to achieve Agency Information Resources Management (IRM) goals and objectives. Key metrics will be established that link EA successes with alignment of IT capabilities to mission requirements, improved security, actual cost savings, performance improvements, reduction of duplication, and improved agility/flexibility through simplification and standardization. Based on these successes, EA will support mission outcomes and business and science results, as well as assure integrated infrastructure that provides NASA workers the IT resources they need to do their jobs within a comprehensive security framework.
- b. The NASA Chief Enterprise Architect (NCEA) shall track these results and review the outcomes with the NASA Chief Information Officer (CIO) at least annually to communicate results and feedback, in order to improve the investment process, investment performance, and the EA program process.

## **P.6 Cancellation**

NPR 2830.1, NASA Enterprise Architecture Procedures, dated February 9, 2006.

Original Signed by  
Larry N. Sweet  
Chief Information Officer

# Chapter 1: The NASA EA Program

## 1.1 Enterprise Architecture Overview

a. NASA's EA Program is the ongoing process of translating business strategy and vision into effective information technology (IT) processes, services, and infrastructure. NASA EA informs and optimizes the IT investment decision process to ensure that IT expenditures are aligned with Agency, Mission Directorate, and Center goals while reducing unnecessary duplication of both material expenditures and efforts. NASA EA promotes effective planning and alignment of technology and resources to support NASA's Mission.

b. NASA's EA process utilizes a multi-phase approach that aligns with the steps of the IT investment management process to develop the NASA IT architecture. The EA process is driven by NASA's strategic planning guidance and utilizes this and other inputs to develop the target architecture. This target architecture is then compared against the current IT environment, resulting in a gap analysis and transition plan. The transition plan supports the future IT needs of NASA and progression toward the target architecture.

c. The term IT, as defined by Clinger-Cohen with respect to an executive agency, means any equipment or interconnected system or subsystem of equipment which is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information by the executive agency. Information technology includes computers, ancillary equipment, software, firmware and similar procedures, services (including support services), and related resources.

## 1.2 NASA EA Objectives

a. The goal of the NASA EA Program is to be the authoritative reference for effective IT planning and execution within NASA. This goal will be attained through the compliance with and the results of the EA process activities and products described in this NPR. The following objectives are key to realizing the full value of EA:

- (1) Establishing and maintaining the EA process and activities within the process.
- (2) Developing authoritative EA products that are utilized throughout the IT life cycle.
- (3) Enhancing the IT governance process by providing timely strategic investment information.
- (4) Establishing effective EA communication mechanisms that allow for easy access and usage of EA information and products.
- (5) Measuring EA effectiveness through meaningful metrics and continuously improving the EA program.

## 1.3 OMB EA Outcomes

NASA EA outcomes are aligned to those of the White House Office of Management and Budget

(OMB) "The Common Approach to Federal Enterprise Architecture" published May 2, 2012, that states:

"EA is uniquely positioned as the management best practice which can provide a consistent view across all program and service areas to support planning and decision-making. EA standards also promote mission success by serving as an authoritative reference, and by promoting functional integration and resource optimization with both internal and external service partners."

b. OMB goes on to define four outcomes enabled by an effective EA: Service Delivery, Functional Integration, Resource Optimization, and Authoritative Reference. OMB emphasizes that "...these four outcomes are 'primary' in that they represent areas of direct, positive impact that architectures can make within and between agencies and with customers and partners external to government."

c. The four EA outcomes defined in "The Common Approach" are as follows:

(1) Service Delivery. Federal Agencies exist to perform a wide spectrum of missions that meet our Nation's ongoing needs through a variety of programs and services. Success in accomplishing an Agency's mission and optimizing resources requires a coherent and consistent understanding of program and service performance and agile planning and development processes. This coherent view and agility becomes more important in resource-constrained operating environments. EA must ensure that IT enables the business and mission functions to achieve optimal performance.

(2) Functional Integration. Functional integration denotes interoperability between applications, systems, and services. Applications, systems, and services interoperability is foundational for Federal Government organizations to be able to leverage current investments to successfully deliver more efficient service offerings. EA should provide context and be the source of standards for all levels of interoperability.

(3) Resource Optimization. As custodians of public funds, Federal sector organizations have a special responsibility to optimize their use of resources. Also, because of a variety of factors that cannot be anticipated or controlled, Federal organizations must often accomplish their mission with fewer resources than anticipated. The organization's EA supports effective planning and decision making in this resource constrained environment.

(4) Authoritative Reference. Just as the blueprints of a building are the authoritative reference for how a structure will be built and function, the organization's Enterprise Architecture provides a roadmap for an integrated, consistent view of strategic goals, mission and support services, data, and enabling technologies across the entire organization, including programs, services, and systems. When EA is recognized as the authoritative reference for the design and documentation of systems and services, issues of ownership, management, resourcing, and performance goals can be resolved in a more consistent and efficient manner.

## 1.4 EA Requirements and Governance

### 1.4.1 Clinger-Cohen Act

Executive Order 13011, Federal Information Technology, implements the Information Technology Management Reform Act (ITMRA) of 1996, also known as the Clinger-Cohen Act. The Clinger-Cohen Act assigns the responsibility for "developing, maintaining, and facilitating the implementation of sound and integrated IT architectures for agencies" to the NASA CIO.

#### 1.4.2 Office of Management and Budget Requirements

a. "Common Approach to Federal Enterprise Architecture," May 2, 2012, defines updated reference models and EA submission requirements for Federal Agencies.

b. OMB Circular A-130, Management of Federal Information Resources requires, "As part of the EA effort, agencies must use or create an Enterprise Architecture Framework. The Framework must document linkages between mission needs, information content, and information technology capabilities. The Framework must also guide both strategic and operational IRM planning."

c. Additional OMB EA requirements are found in:

(1) "The Common Approach to Federal Enterprise Architecture" published by the OMB (May 2, 2012) provides guidance for a common approach to the practice of EA throughout the Executive Branch of the U.S. Federal Government. The document promotes increased levels of mission effectiveness by standardizing the development and use of architectures within and between Federal Agencies.

(2) OMB Circular A-11, Preparation, Submission, and Execution of the Budget, outlines the requirements and guidelines for the Federal budget process.

#### 1.4.3 NASA Directives and Requirements

a. NPD 2830.1 - NASA Enterprise Architecture. Establishes the policy and responsibilities for maintaining and using the NASA EA. Under the direction of the Agency Chief Information Officer (CIO), the NASA EA program will develop and maintain the NASA enterprise architecture which will serve as the primary authoritative resource for IT planning and execution.

b. NPR 2800.1B - Managing Information Technology. Establishes requirements and responsibilities for managing IT relative to the policy set forth in NPD 2800.1B. By implementing IT procedures and requirements that are aligned with NASA's Strategic Plan and integrated with its strategic management process, NASA seeks to make measurable improvements in mission performance, cost of program/project development and operations, and service delivery to the public through the strategic application of IT.

c. NPR 7120.7 - Information Technology and Institutional Infrastructure Program and Project Management Requirements. Establishes the requirements by which NASA will formulate and execute information technology and institutional infrastructure programs and projects, consistent with the governance model contained in the NASA Governance and Strategic Management Handbook (NPD 1000.0).

d. NPD 1001.0. - NASA Strategic Plan. Establishes the NASA mission goals and objectives for ten years.

e. NPR 9420.1 - Budget Formulation. Provides the financial management, performance requirements, and process for budget formulation.

f. NPR 1441.1 - NASA Records Retention Schedules. Provides retention periods of Federal records of NASA.



## Chapter 2: The NASA EA Process and Key Documents

### 2.1 NASA EA Process

a. The NASA EA Process is an integral part of the investment management life cycle, from the Strategic Plans developed in the first phase of the Planning, Programming, Budget, and Execution (PPBE) process as outlined in NPR 9420.1, through the selection and implementation phases of the Capital Planning and Investment Control (CPIC) process. EA provides the strategic IT roadmap to ensure that IT spending decisions are aligned to best support NASA's mission and business goals. This NPR is a complementary document to the NPR 7120.7/NID 7120.99, NASA Information Technology and Institutional Infrastructure Program and Project Management Requirements, on the program and project management of informed Government acquisition of technology, and the management of that technology.

b. All IT investments made at the Enterprise, Mission Directorate, Program, Project, and Center levels shall align with the Agency Enterprise Architecture. With the assistance of active stakeholder participation, the NASA EA Process provides the structure and discipline that helps align our strategic goals and objectives with implemented IT architecture and effectively guides and influences IT investment decisions. These investment decisions, based on the NASA EA Process, will support efficient, effective, and economical acquisition, implementation, and disposition of information resources, while accommodating the varying needs of a diverse user community.

c. The EA Process shown in Figure 2 describes the NASA EA program functions throughout the entire NASA investment management life cycle. The EA is the sum of multiple architectures, and the process is continuous. While only the Agency-level and Center-level are depicted in the diagram, the EA Process encompasses the Mission Directorate, Program and Project level architectures, as each of these are architected and implemented at the Agency-level and Center-level. The Agency-level provides the enterprise view of each specific EA activity and plan, while the Center-level provides an aligned and complementary Center view of these activities and plans.

d. Chapter 3 breaks down the development and use of the EA process in Figure 2-1 (below) in further detail.

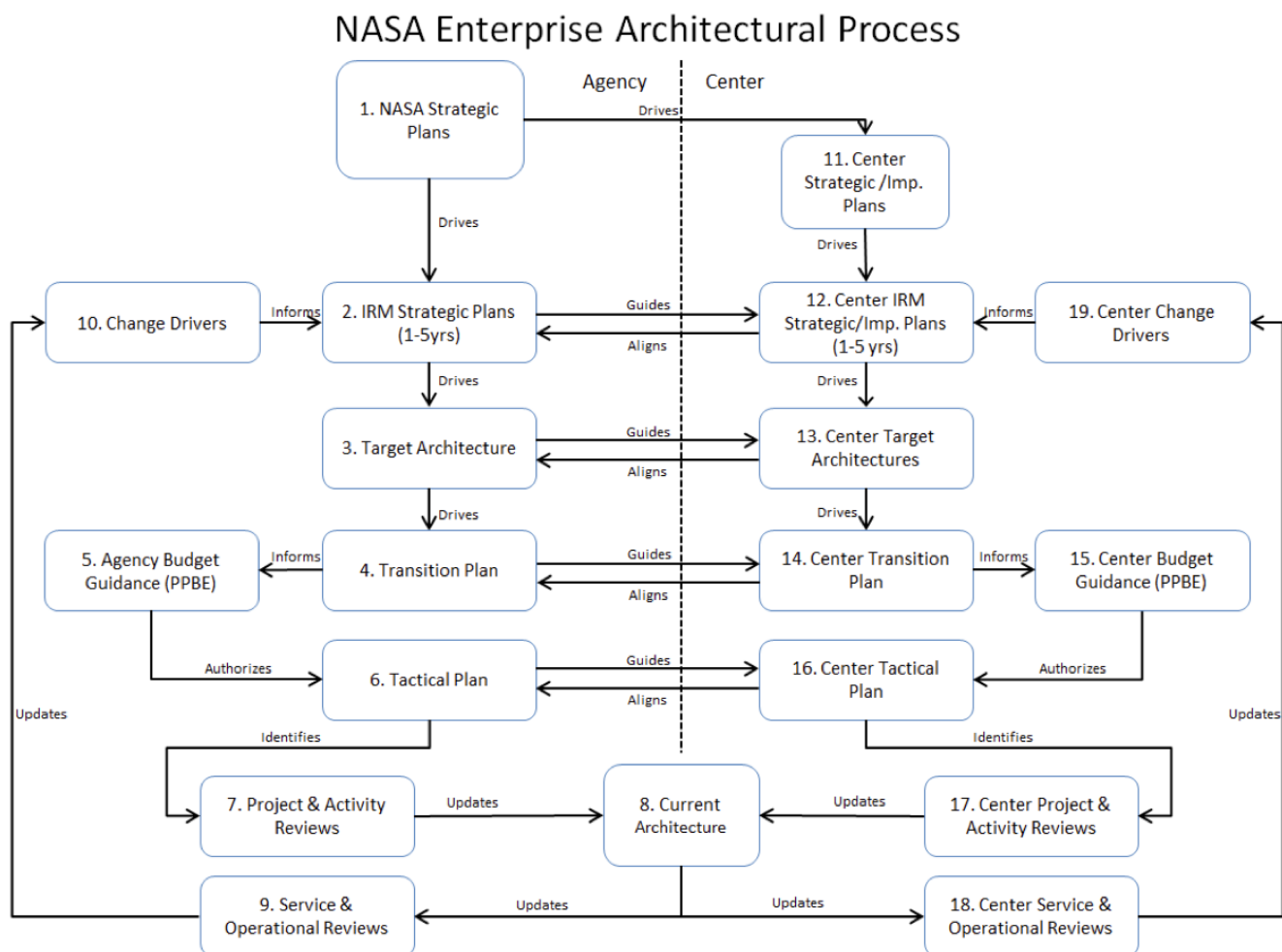


Figure 2-1 NASA EA Process



# Chapter 3: Development and Use of the EA Process

## 3.1 NASA EA Process

- a. The NASA CIO is responsible for providing Enterprise IT resources and processes that enable mission success. The NASA CIO has delegated to the NCEA responsibility for maintaining the NASA EA program and processes and facilitating strategic IT decision making in alignment with mission goals. Personnel responsible for IT planning, development, and implementation will collaborate with the NCEA or designated architect to ensure that their mission, program, project and Center IT projects are in compliance with the architecture and the strategic goals of the Agency.
- b. Each Center Director, via the Center CIO, has delegated to the Center Enterprise Architect (CEA) responsibility for the Center-specific EA program and processes that shall align and complement the Agency-level EA efforts.
- c. All IT initiatives and service offerings shall comply with the approved NASA EA. The NCEA has instituted review processes to ensure adherence of all NASA IT initiatives and service offerings to NASA Strategic Plans and Mission Support needs. The NASA CIO maintains oversight responsibility for all of the IT investments of NASA.
- d. Each of the EA Process steps detailed below identifies the specific products and outcomes, roles and responsibilities, and procedural requirements that govern each Agency EA activity. These steps correspond with the boxes on the EA process diagram in Figure 2-1. The Center-level activities and plans below identify similar steps that should be occurring at the Center- level to align and complement the Agency efforts.

## 3.2 NASA Strategic Plan

### 3.2.1 Description

The NASA Strategic Plan outlines NASA's long-term goals and describes at a high level how NASA will accomplish these goals. The plan addresses NASA's missions, workforce, and technical capabilities that support them, as well as the continuous improvements in technological and operational efficiencies.

### 3.2.2 Products/Outcomes

The NASA Strategic Plan outlines the Agency's long-term vision and identifies specific goals and how NASA intends to accomplish those goals over a ten-year period. The document details the specific missions and programs and will drive the IT strategy and investments necessary to accomplish these goals.

### 3.2.3 Roles and Responsibilities

The NASA Strategic Plan is the responsibility of the Administrator and Deputy Administrator. The NASA CIO and NCEA must maintain a formal, ongoing dialogue to ensure enterprise IT strategy is

properly positioned to meet mission and business needs and to ensure mission stakeholders are aware of IT change drivers that could influence mission investments. Likewise, the Center CIOs and EAs must maintain an ongoing dialogue with Center stakeholders to ensure Center IT strategy is positioned to meet Center needs and ensure stakeholders are aware of IT change drivers that could influence Center investments.

#### 3.2.4 Procedural Requirements/Governance

NPD 1001.0 - 2011, NASA Strategic Plan

### 3.3 NASA IRM Strategic Plan

#### 3.3.1 Description

The NASA IRM Strategic Plan, referred to as the IRM, is the NASA CIO's plan to guide the direction, focus, mission alignment, principles, investments, initiatives, and accountability of the NASA organization and to maximize the value of IT to NASA missions, programs, partners, stakeholders, and the American public.

#### 3.3.2 Products/Outcomes

Annually, the NASA Office of the Chief Information Officer (OCIO) reviews progress made toward the IRM Strategic Plan and adjusts and publishes updates to the plan, as appropriate. This key Agency IT document guides and informs the Agency and Center strategic plans for IT and establishes Agency IT spending priorities and guides the allocation of IT resources.

#### 3.3.3 Roles and Responsibilities

The NASA CIO is directed to develop and maintain a strategic IRM plan. The EA role is to provide the IRM development process with change driver input and to utilize the IRM plan in the development of the target architecture and transition plans. The NCEA facilitates the development, consolidation, and analysis of the change drivers. Centers utilize the IRM to guide their development of Center IT strategies.

#### 3.3.4 Procedural Requirements/Governance

Section 3506(b) (2) of Title 44 of the United States Code and the Clinger-Cohen Act of 1996. The IRM is approved by the NASA Mission Support Council (MSC).

### 3.4 Target Architecture

#### 3.4.1 Description

The target architecture is the formal documentation that translates mission strategy into IT direction by defining the future state of NASA's IT enterprise. It describes the environment where the IRM goals and objectives are met. The enterprise target architecture is comprised of Agency and Center-level architectures. Agency target architecture guides Center architecture development. Center target architecture aligns with and complements the Agency target architecture.

#### 3.4.2 Products and Outcomes

a. Formal documentation of the Agency target IT architecture detailing vision, goals and objectives,

guidance, and reference models. The Agency target architecture will document the integration of all Agency-level domain and cross-domain target architectures.

b. Formal documentation of the individual Agency-level domain and cross-domain target architectures. Target architectures shall be documented for the following domains: Host Computing, End-User Computing, Applications, Communication, Information, and Security. These domains make up the fundamental infrastructure that supports NASA's IT services. Cross-domain target architectures address specific IT mission or business needs that cut across two or more domains. Domain and cross-domain services and architectures can span multiple Centers. Each of the domain and cross-domain architectures consist of targets described from a people, process, technology, performance, and data perspective.

c. Formal documentation of each Centers target IT Architecture that provide the vision, goals and objectives, guidance, and reference models for the Center, and is in alignment with, and complements the Agency target architecture. The Center target architecture will document the integration of all Center-level domain and cross-domain target architectures.

d. All target architectures will align with the NCEA approved reference models.

### 3.4.3 Roles and Responsibilities

a. The NCEA shall be responsible for the delivery of the integrated Enterprise Target IT Architecture which is comprised of Agency and Center architectures. The NCEA shall collaborate with domain, cross-domain, and Center architects, mission subject matter experts, service executives, Chief Technology Officer (CTO), and other stakeholders in the development of the target architecture. The NCEA is the curator of all enterprise and Agency-level products.

b. For domain and cross-domain architects, the NASA CIO/NCEA invites or nominates a candidate based on the necessary experience, skill set, or role, and the candidate accepts or rejects the nomination. The candidate, his or her direct manager, and the NCEA agree on the amount of time the candidate will spend fulfilling the domain or cross-domain duties and the length of the appointment. All candidate nominations are recorded, and appointments are formally confirmed by NCEA and the candidate's manager.

c. Domain architects are responsible for developing their respective Agency-level architectures in collaboration with the NCEA, other domain and cross-domain architects, Center architects, mission architects, service executives, and other stakeholders. Domain architects will help ensure that the Agency has integrated target architecture. Domain architects are the curators of their architecture products.

d. Cross-domain architects are responsible for developing their respective Agency-level Cross-domain target architectures in collaboration with the NCEA, other domain and cross-domain architects, Center architects, mission architects, service executives, and other stakeholders. Cross-domain Architects will help ensure that the Agency has an integrated target architecture. Cross-domain architects are the curators of their architecture products.

e. Center Architects are responsible for developing their respective Center-level target architecture in collaboration with the NCEA, other domain and cross-domain architects, other Center architects, mission architects, service executives, and other stakeholders. Center architects shall align their target architecture with the Agency target architecture. Center architects are the curators of their architecture products.

### 3.4.4 Procedural Requirements/Governance

- a. The NASA Enterprise Architecture Board (EA Board) is the approval authority for the Enterprise Target IT Architecture, in consultation with appropriate governance bodies. The EA Board is responsible for overseeing the development of the target architecture.
- b. Center-level target architectures are reviewed and approved by the appropriate Center governance board(s) and shall align with and complement the Agency target architecture.

## 3.5 Transition Plan

### 3.5.1 Description

NASA's Enterprise IT Transition Plan is the Agency's integrated five-year plan with the primary purpose of achieving IRM goals and objectives by advancing all domain and cross-domain architectures from the current state to the target architecture. This plan identifies a prioritized set of investments, funding requirements, and milestones required to progress toward the enterprise target architecture. The enterprise transition plan is comprised of Agency and Center-level plans and provides linkages between all domain and cross-domain target architectures. The plan's timeframe aligns with the Federal budget cycle, as identified in the PPBE process, and provides input to and receives guidance from the Agency Budget Process and Investment Boards that ultimately determine deliverables identified in the transition plan. The completed plan will authorize the investments to be made in the annual tactical plans for use at both the Agency-level and Center-level.

### 3.5.2 Products and Outcomes

- a. An Agency-level IT Transition Plan is formal documentation that integrates all Agency-level domain and cross-domain IT investments, funding requirements, and specific milestones prioritized by year for a period of five years.
- b. Separate formal transition plans for each Agency-level Domain and Cross-domain that identify all IT investments, funding requirements, and specific milestones prioritized by year for a period of five years.
- c. A Center transition plan is formal documentation that identifies and integrates all Center-level domain and cross-domain IT investments and contains funding requirements and specific milestones prioritized by year for a period of five years. The Center-level transition plans shall align to and complement the Agency transition plan.
- d. The transition plans will be delivered 60 days prior to the start of the budget formulation process.

### 3.5.3 Roles and Responsibilities

- a. The NCEA shall be responsible for the delivery of the integrated Enterprise IT Transition Plan which is comprised of Agency-level and Center-level plans. The NCEA will work collaboratively with a variety of stakeholders, including the Enterprise Service Integration Lead, Program/Service Executives, mission and science subject matter experts, domain and cross-domain architects, Center EAs, CTOs, and Investment Managers to develop the plan.
- b. The NCEA shall be responsible for integrating the Agency-level domain and cross-domain transition plans and for briefing the integrated Agency transition plan to the appropriate governance

boards. The NCEA is the curator of all enterprise-level products.

c. Domain and cross-domain architects are responsible for developing the prioritized set of IT investments, funding requirements, and milestones for each individual domain and cross-domain transition plan. The domain architects will work collaboratively with the NCEA, other domain and cross-domain architects, Center architects, mission architects, service executives and other stakeholders. Domain and cross-domain architects are curators of their respective products.

d. The Center EA shall be responsible for developing their respective Center Transition Plans that align with and complement the Agency Transition Plan. The Center architects will work collaboratively with the NCEA, domain and cross-domain architects, Center architects, mission architects, service executives, and other stakeholders. The Center EA is the curator of all Center-level products.

#### 3.5.4 Procedural Requirements/Governance

a. The NASA EA Board is the approval authority for the Enterprise Transition Plan, in consultation with appropriate governance bodies. The EA Board is responsible for overseeing the development of the Enterprise Transition Plan.

b. Center-level transition plans are approved by the appropriate Center governance board(s) and shall align with and complement the Agency Transition Plan.

## 3.6 Agency Budget Guidance (PPBE)

### 3.6.1 Description

NASA develops its budget in accordance with the PPBE process. The PPBE process requires an enhanced level of analysis during budget formulation to ensure that resource alignment supports the accomplishment of Agency strategic goals and objectives. As part of budget formulation, the Agency budget guidance must align with the IRM Strategic Plan. The Enterprise IT Transition Plan is provided to the Investment Boards and other stakeholders during the budget process. This plan provides an integrated path to the target architecture and ensures alignment to the IRM plan's goals and objectives.

### 3.6.2 Products and Outcomes

Agency budget guidance is produced as part of the annual PPBE process. The budget guidance received from the PPBE process is used as an input to develop tactical plans and to update the transition plans.

### 3.6.3 Roles and Responsibilities

a. The NCEA, as the overall transition plan integrator, will advocate for appropriate investments that support the transition plan, by coordinating with service owners, program/service executives, portfolio managers, CIOs, and other stakeholders. As part of the Investment Review process, the NCEA shall analyze and communicate any gaps, risks, or potential impacts associated with unfunded goals and activities to the Investment Review Board(s). The NCEA will also review all Summary Investment Business Case (SIBC) entries and all major IT investments to produce findings and recommendations to validate alignment of the investment with the target architecture and transition plan.



b. Domain and cross-domain architects will help advocate for appropriate investments that support their particular transition plan, by coordinating with the NCEA, service owners, program/service executives, portfolio managers, CIOs, and other stakeholders. As part of the Investment Review process, the domain and cross-domain architects shall analyze and communicate any gaps, risks, or potential impacts associated with unfunded goals and activities to the Investment Review Boards associated with their domain. Domain and cross-domain architects should review all SIBC entries and all major IT investments associated with their domains to produce findings and recommendations to validate alignment of the investment with the domain target architecture and transition plan.

c. The Center architects will advocate for appropriate investments that support the Center Transition Plan, by coordinating with service owners, program/service executives, portfolio managers, Center CIO, and other stakeholders. As part of the Investment Review process, the Center architect shall analyze and communicate any gaps, risks, or potential impacts associated with unfunded goals and activities to the Center Investment Review Boards. The Center architect should also review all Center SIBC entries and all major Center IT investments to produce findings and recommendations to validate alignment of the investment with the Center target architecture and transition plan.

d. Investment owners should utilize the review findings and recommendations to make appropriate changes to the investments.

e. Investment owners, portfolio managers, and the CIOs should utilize the EA findings and recommendations to make informed decisions about investments.

#### 3.6.4 Procedural Requirements/Governance

a. NPR 9420.1 - Budget Formulation

b. OMB Circular A-11- Preparation, Submission, and Execution of the Budget

c. NPR 2800.1B - Managing Information Technology

## 3.7 Tactical Plan

### 3.7.1 Description

The Enterprise IT Tactical Plan is the Agency's current execution year plan to implement the approved and funded investments identified in the transition plan and authorized through the PPBE process. The tactical plan is an integrated document, based on prioritized, annual investment milestones. The plan includes all domain and cross-domain investments at the Agency-level and Center-level.

### 3.7.2 Products and Outcomes

a. A formal integrated Agency-level plan that includes all Agency-level domain and cross-domain strategic performance criteria, annual project milestones, deliverables, and risks for each authorized Agency investment for the current execution year.

b. Formal Agency-level plans for each domain and cross-domain that aggregate all strategic performance criteria, annual project milestones, deliverables, and risks of each authorized investment for the current execution year.



c. Formal Center-level plans that include all Center-level domain and cross-domain strategic performance criteria, annual project milestones, deliverables, and risks for each authorized Center investment for the current execution year. The Center plan aligns and complements the Agency tactical plan.

### 3.7.3 Roles and Responsibilities

a. Based on outputs from the PPBE process, the OCIO Capital Planning and Governance Division shall be responsible for creating the integrated Agency Tactical Plan in partnership with the NCEA, Program/Service Executives, Domain and Cross-domain Architects, Center EAs, CTOs, and Investment Managers.

b. The NCEA shall be responsible for reviewing alignment of the Tactical Plan with the Transition Plan, and validating linkages to the Agency Strategic Plan.

c. The domain and cross-domain architects shall be responsible for reviewing alignment of the Tactical Plan with their respective Transition Plans to ensure linkages to the Agency Strategic Plan.

d. The Center EA shall be responsible for collaborating with Center CIO and Center executive management to develop the Center Tactical Plan that aligns with and complements the Agency plans.

### 3.7.4 Procedural Requirements/Governance

Agency-level IT governance boards are the approval authorities for the NASA Agency Tactical Plan. Center-level tactical plans are approved by the appropriate Center governance board(s).

## 3.8 Project and Activity Reviews

### 3.8.1 Description

a. NASA projects are finite undertakings to create a product, service or result and have a defined beginning and end. NASA EA project reviews take place as projects move through the various life-cycle gates at the Agency-level and Center-level. An activity is a component of work that is performed periodically or part of an overall process, product, or service and does not have a defined beginning and end. These reviews ensure that projects and activities are aligned to the Agency and Center Target Architectures and Transition Plans.

b. EA project and activity reviews shall be included in existing project management reviews and in milestones, rather than conducted as stand-alone activities. This will minimize overlap with other reviews, while providing broader discussion of EA findings and recommendations.

c. The NASA EA checklist is used to ensure application of standard review criteria and to provide feedback to continuously improve the project and its alignment with the target architecture.

### 3.8.2 Products and Outcomes

a. The NASA EA checklist is utilized during EA reviews to provide a comprehensive and evolving reference to the target architectures at both the Federal-level and Agency-level to which projects and activities must align. The data collected through the checklist identifies the degree of alignment with the target architecture and transition plan. Centers can add content to the checklist that supports specific architecture data required for a Center review.

- b. Results of the project and activity reviews are summarized in the form of findings and recommendations. These results provide guidance to project managers, sponsors, portfolio managers, and other stakeholders to support informed decisions on IT projects and future project funding.
- c. The Agency EA repository accumulates data from all reviews to measure progress toward Federal and Agency initiatives such as sharing and reuse, regulatory compliance, and integrated service catalogs and help desks.

### 3.8.3 Roles and Responsibilities

- a. The NASA EA checklist and associated processes are the responsibility of the NCEA, with support from the EA community.
- b. The EA Project and Activity reviews are performed by NASA OCIO/NCEA approved architects familiar with the EA checklist and EA processes.
- c. Project managers and technical leads should utilize the review findings and recommendations to make appropriate changes to the projects and activities.
- d. Project sponsors, portfolio managers, system owners, and the CIOs should utilize the EA findings and recommendations to make informed decisions about project and activity investments.

### 3.8.4 Procedural Requirements/Governance

EA reviews are required in accordance with NPR 7120.7 guidelines. Reviews on activities or projects that don't meet NPR 7120.7 criteria may be initiated by the Agency or Center architects, program or project managers or project or activity sponsors.

## 3.9 Current Architecture

### 3.9.1 Description

- a. NASA's current architecture describes the current state of NASA IT environment. The current architecture is built from an aggregation of information about IT services, applications, and assets across the Agency.
- b. This information is drawn from multiple Enterprise, Mission, and Center sources, including, but not limited to, architectural tools, project and activity reviews, IT service catalogs, end-user configuration management databases, system-level designs, application inventories, and all other IT asset inventory systems.

### 3.9.2 Products and Outcomes

- a. Data about the current architecture is collected as needed from multiple sources, including data calls, and automated tools and is consolidated within the enterprise architecture repository.
- b. The current architecture data provides support for service and operational reviews that in turn provide change driver information to the IRM process.
- c. The current architecture is an assessment tool for measuring maturity and progress towards the NASA to-be state and provides key information for Office of Management and Budget (OMB) submissions.

### 3.9.3 Roles and Responsibilities

- a. Management and documentation of all service and operational assets are the responsibility of service owners and providers who shall make this information available to NCEA and other architecture stakeholders on an as requested basis.
  - b. The NCEA, in close collaboration with stakeholders, shall develop and maintain Agency-level architectural standards and models to ensure current architecture information is accurately maintained and reported.
  - c. Domain architects, in close collaboration with stakeholders, shall develop and maintain architectural standards/models to ensure current architecture information is accurately maintained and reported for their respective domains.
  - d. Cross-domain architects, in close collaboration with stakeholders, shall develop and maintain architectural standards/models to ensure current architecture information is accurately maintained and reported for their respective domains.
  - e. Center architects, in close collaboration with stakeholders, shall develop and maintain architectural standards/models to ensure current architecture information is accurately maintained and reported for their respective Centers. Center standards shall align with and complement Agency standards.
- 3.9.4 Procedural Requirements/Governance
- a. The NASA CIO is the approval authority for the Agency IT architecture standards/models, in consultation with appropriate governance bodies.
  - b. Center-level standards/models reviewed and approved by the Center CIOs, in consultation with appropriate Center governance board(s), and shall align and complement the Agency standards/models.

## 3.10 Service and Operational Reviews

### 3.10.1 Description

- a. NASA EA service reviews evaluate whether current operational IT services are achieving intended results, meeting business requirements, and performing at agreed upon service levels. Operational reviews assess functional requirements and the operational performance of the supporting IT infrastructure. The reviews help identify opportunities to improve NASA IT services and provide input back into the enterprise architecture process steps.
- b. Service and operational reviews are initiated by NASA Enterprise Architects when opportunities to improve the architecture are identified by indicators such as customer feedback, external drivers, or performance metrics. A service review may also be initiated by service owners to assess the value of current or future investments.

### 3.10.2 Products and Outcomes

- a. Service and operational reviews employ the NASA EA checklist to identify the degree of alignment to the evolving target architecture and services portfolio. The reviews determine whether sustained investment in the existing services is justified or improvements are needed.
- b. Opportunities for cost savings from sharing and reuse are considered through analysis of similar services offered in inter-Agency and extra-Agency service catalogs. Potential budget shortfalls or

cessation of services are documented to show the impact and risks to the business and missions.

c. The service and operational reviews are summarized in the form of findings and recommendations that shall be provided to the service owners, portfolio managers, and other stakeholders. The checklist data and findings are aggregated in the EA repository.

### 3.10.3 Roles and Responsibilities

a. The NASA EA checklist and associated processes are the responsibility of the NCEA with support from the Center EA community.

b. The service reviews are performed by NASA OCIO/NCEA approved Enterprise Architects familiar with the NASA EA checklist and associated processes.

c. Service owners, program/service executives, and portfolio managers should utilize the review findings and recommendations to support informed investment decisions.

### 3.10.4 Procedural Requirements/Governance

The results of the NASA EA service reviews and operational reviews are inputs into OCIO's performance management process. OCIO periodically reviews investment performance to validate that approved investments are being executed according to plan and are achieving the intended strategic benefits. EA service and operational reviews input back into the strategic planning and enterprise architecture processes.

## 3.11 Change Drivers

### 3.11.1 Description

Change drivers are forces that create a change in the IT environment that may impact NASA. These changes influence the NASA Strategic Plan and inform the IRM planning processes. The drivers provide input from programmatic and institutional customers on their strategy, IT needs, opportunities, vulnerabilities, constraints, and goals that are critical to developing a comprehensive IT strategy for NASA. The drivers also include information on laws and mandates, policy and policy changes, technology trends, risks, and other environmental factors or gaps that impact IT planning.

### 3.11.2 Products and Outcomes

a. Change drivers are formalized in an integrated collection of IT-related data and analysis deliverables. These deliverables will be communicated through the OCIO, as input into the NASA Strategic Planning process.

b. Change drivers will be delivered to stakeholders at least 30 days prior to the start of the NASA Strategic Planning Process.

c. Types of change drivers include, but are not limited to:

(1) Industry/technology trends in the commercial and government sectors. They provide some insight into what IT could or should be utilizing to support its mission.

(2) Mission IT needs are derived from analysis of mission business needs which are translated into IT requirements.

(3) IT technology research and development investments, as described in the Strategic Space Technology Investment Plan and the associated IT Technology Roadmaps, are developed and maintained by the Office of Chief Technology.

(4) Service reviews provide analysis of deployed IT services at NASA and how well the services are performing. These reviews identify opportunities for service improvement or enhancement.

(5) Analysis of current IT environment.

(6) Policy and policy changes impacting the enterprise architecture and its goals, objectives, and priorities.

(7) Standards identify all commercial, governmental, and internal NASA standards that apply to NASA IT.

(8) Laws and mandates that impact NASA IT.

(9) Risks that threaten the ability of current IT infrastructure to support the achievement of NASA's strategic goals.

(10) Other environmental factors or gaps not previously mentioned that could or will have an impact on IT decisions at NASA.

### 3.11.3 Roles and Responsibilities

a. The NCEA shall facilitate the gathering, development, analysis, and integration of all IT-related change drivers into a coherent artifact for approval by the OCIO. This approved artifact is then delivered to the strategic planning and architecture stakeholders. The NCEA should collaborate with domain architects, cross-domain architects, Center architects, mission architects, service executives, and other councils, boards, and stakeholders in the development of the change drivers. The NCEA is the curator of the change driver package artifact.

b. The Council shall develop, maintain, and provide analysis of all industry/technology trends and collaborate with the NCEA in integration of those trends into a coherent change driver package for delivery to strategic planning and architecture stakeholders. The CTO-IT Council will collaborate with domain architects, cross-domain architects, Center architects, mission architects, service executives, and other stakeholders in the development of the trends. The CTO-IT Council is the curator of all industry/technology trends products.

c. Domain architects shall develop, maintain, and provide analysis of all change driver areas as they relate to their domains and collaborate with the NCEA in integrating those change drivers into a coherent change driver package for delivery to strategic planning and architecture stakeholders. Domain architects should collaborate with cross-domain architects, Center architects, mission architects, service executives, and other stakeholders in the development of the change drivers. The domain architects are the curators of all change driver products that relate to their respective domains.

d. Cross-domain architects shall develop, maintain, and provide analysis of all change driver areas as they relate to their domains and collaborate with the NCEA in integrating of those change drivers into a coherent change driver package for delivery to strategic planning and architecture stakeholders. Cross-domain architects should collaborate with domain architects, Center architects, mission architects, service executives, and other stakeholders in the development of the change drivers. The cross-domain architects are the curators of all change driver products that relate to their

respective domains.

e. Center architects shall facilitate the gathering, development, analysis, and integration of all Center IT-related change drivers into a coherent artifact for approval by the Center CIO. The approved artifact is then delivered to the Center strategic planning and architecture stakeholders as well as to the NCEA. The Center architect should collaborate with domain architects, cross-domain architects, Center architects, mission architects, service executives, and other Center councils, boards, and stakeholders in the development of the change drivers. The Center architect is the curator of the Center change driver package artifact.

#### 3.11.4 Procedural Requirements/Governance

Agency change drivers will be approved by the OCIO before being provided to Agency-level strategic planning and architecture stakeholders. Center change drivers will be approved by the Center CIOs before being provided to Center-level strategic planning and architecture stakeholders.



## 4.0 Chapter 4: Measurement/Verification

### 4.1 Agency EA Results

- a. NASA EA effectiveness will be measured based on the results of IT implementations to achieve Agency IRM goals and objectives. Key metrics will be established that link EA successes with alignment of IT capabilities to mission requirements, improved security, actual cost savings, performance improvements, reduction of duplication, and improved agility/flexibility through simplification and standardization. Based on these successes, EA will support mission outcomes, business and science results, as well as assure integrated infrastructure that provide NASA workers the IT resources needed within a comprehensive security framework.
- b. The NCEA shall track these results and review the outcomes with the CIO at least annually to communicate results and feedback, in order to improve the investment process, investment performance, and the EA program process.
- c. The NCEA will work with internal and external stakeholders to develop and mature EA metrics that clearly illustrate progress or deficiencies in key areas. The specifics of these metrics shall be agreed to by both stakeholder groups and provide information useful to determining benefit of the associated Agency goals. This information will then be delivered under a separate EA guidance document.

### 4.2 OMB Submissions

- a. In order to comply with OMB mandates, the NASA EA submits products on a regular basis to the Federal Enterprise Architect. As these inputs evolve under new guidelines, NASA will be evaluated and given direct feedback on the completeness, quality, and timeliness of these submissions.
- b. The NCEA shall track these results and review the outcomes with the NASA CIO at least annually to ensure results and feedback will be used to improve both the EA program and investment performance.

# Appendix A: Acronyms

Acronym	Description
APM	Application Portfolio Management
CEA	Center Enterprise Architect
CIO	Chief Information Officer
CPIC	Capital Planning and Investment Control
CSB	Cloud Services Brokering
CTO	Chief Technology Officer
CTO-IT	Chief Technology Officer for Information Technology
EA	Enterprise Architecture
EA Board	Enterprise Architecture Board
IRM	Information Resources Management
IT	Information Technology
ITMRA	Information Technology Management Reform Act
MSC	Mission Support Council
NCEA	NASA Chief Enterprise Architect
NID	NASA Interim Directive
NPD	NASA Policy Directive
NPR	NASA Procedural Requirements
OCIO	Office of the Chief Information Officer
OMB	Office of Management and Budget
PMA	Policy Management Authority
PPBE	Planning, Programming, Budgeting and Execution (process)
SIBC	Summary Investment Business Case

# Appendix B: Domain Definitions

The Enterprise Target Architecture is comprised of six integrated core Infrastructure Services Domains: Host Computing, End-User Computing, Applications, Communication, Information, and Security. These domains make up the fundamental infrastructure that supports NASA's IT services.

## B.1 Host Computing

**Host Computing.** The Host Computing Architecture and Services Domain encompasses all of the enterprise services necessary to ensure the efficient use of compute and storage assets. This domain includes the following service areas:

**a. Housing Services.** Internal NASA resources, as well as commercial capabilities, providing the data center infrastructure to ensure an appropriate environment for a user-to-host computing resources to meet business requirements.

**b. Hosting Services.** NASA resources, as well as commercial capabilities, providing the data center infrastructure, as well as the hosting resources (e.g., servers, storage, operating systems, databases, middleware) to ensure an appropriate hosting capability to support user applications to meet business requirements. Examples would include mainframes, high-performance computing environment, database services, etc.

**c. Infrastructure as a Service.** NASA or commercial provided resources provided as a service with appropriate service levels used for providing hosting services to the user. These services are traditionally abstracted from specific hardware and implemented as resources such as Central Processing Unit (CPU) cycles, Random Access Memory (RAM), storage capacity, and bandwidth. Pricing is based on pay per use pricing. All of the physical hardware used to implement the service is managed by the service provider, and the user is typically required to manage the entire application stack beginning with the operating system.

**d. Platform as a Service.** NASA or commercial provided resources provided as a service with appropriate service levels used for ensuring application hosting services for the customer. These services are traditionally based on a programming environment such as commercial capabilities like Google App Engine®, Microsoft Windows Azure®, PHP, Python, etc. Pricing is based on a pay per use and meet the characteristics defined earlier in this document. The service provider typically manages the infrastructure, as well as the application software, with the user managing the application itself.

**e. Software as a Service.** NASA or commercial provided resources provided as a service with appropriate service levels used for ensuring software capabilities as a service for the customer. These services are commonly utilized applications used by customers such as financial applications and mail systems. Pricing is based on a pay per use and meet the characteristics defined earlier in this document. The service provider typically manages the infrastructure, as well as the application software, with the user managing the application itself.

**f. Storage Services.** NASA or commercial provided resources for short-term as well as long-term storage of user data. Storage services can reside in all of the services defined above. Many cloud providers provide storage services to be used in conjunction with their compute resources. Due to

the complexity and size of some of these requirements, this discussion has been separated into a separate service line item within our architecture.

**g. Cloud Services Brokering (CSB).** CSB is a form of cloud services intermediation and is a business model in which value is added value to one or more (generally public or hybrid, but possibly private) cloud services by an individual or group on behalf of one or more user organizations. In an internal private cloud scenario, the internal IT organization takes on the role of broker. Additional information is provided below after the definition of cloud computing.

## B.2 End User Computing

**End User Computing.** The End User Computing Architecture and Services Domain is the infrastructure segment of IT's scope that is associated with the life-cycle support of devices that stakeholders physically possess and/or manipulate. This domain includes the following service areas:

- a. Technology Evaluation Services.** Track end user IT requirements and identify new end user IT trends and candidates for inclusion.
- b. Integration/Validation Services.** Perform service, system, and EA domain integration to validate and facilitate interoperability of new and existing end user IT.
- c. Configuration Management Services.** Ensure end user services are accessible through management, specification, and documentation of system settings and policies.
- d. Provisioning Services.** Make end user IT available, designate operational and deprecated standards for end user IT, and provide an asset inventory, device specification and software revision, and trending data to enable decision making.
- e. Assessment/Testing Services.** Interactively assess proposed end user IT.

## B.3 Applications

**Applications.** The Applications Architecture and Services Domain is the infrastructure segment of IT's scope that is associated with the life-cycle support of selecting, developing, implementing, operating, and maintaining software solutions. This domain includes the following service areas:

- a. Portfolio Management Services.** Enable the Agency to have a better knowledge of existing capabilities in our current portfolio so that we can work with customers to evaluate existing solutions when new requirements arise. Transparency into the current inventory of applications and resource use is a primary goal of Application Portfolio Management (APM). It is common to find multiple applications at NASA that perform the same function, and many reasons may exist for this duplication (some valid and some not). Redundancy increases complexity and cost, and APM services aims to eliminate/reduce unnecessary application duplication in order to help focus scarce IT resources onto business priorities.
- b. Interoperability Support Services.** Enhance the ability of Agency software systems to interoperate. Interoperability is defined by IEEE Standard Glossary as: "The ability of two or more systems or components to exchange information and to use the information that has been exchanged." Integration is further defined as "the process of combining software components,

hardware components, or both into an overall system." (IEEE Standard Glossary, 1990)

**c. Development and Deployment Services.** Enable the Agency to create and enhance software systems that are uniquely suited to supporting NASA's mission and mission support requirements. This Application Domain Reference Model identifies process areas of Development and Deployment Services and supplies best practice information on processes for effectively executing the activities associated with each process area. The best practices referenced in this document are not meant to circumvent or contradict the directives defined in NASA NPR 7150.2A, but are rather intended to provide additional clarifying insight into methods that can result in a more successful delivery of each process area.

## B.4 Communications

**Communications.** The Communication Architecture and Service Domain is the infrastructure segment of IT's scope that is associated with establishing the reliable transfer of information between people and information technology assets. This domain includes the following service areas:

**a. Transmission Services.** Transmission services provide the physical medium to enable data transfer through NASA's communication infrastructure (LAN/FW/WAN/Internet). Examples include fiber, wire, wireless, and connectors.

**b. Communication Application Services.** Communication application services consist of the supporting services required for data to flow across the communications infrastructure such as DNS, NTP, DHCP, etc. For lack of a better place, Voice over IP is included here.

**c. Communication Management Services.** Communications management services consist of the devices and mechanisms used to manage the flow of data across the communications infrastructure (routers, switches, wireless access point management, global toolsets).

**d. Boundary Management Services.** Boundary management service provide the management and control of information flowing in and out of segments (intra, inter, extra, and other subdivisions) of the NASA communications infrastructure.

## B.5 Information

**Information.** Information domain is defined as governance of and policy for management of information and data. It is also the practice of putting in place measures to mitigate risk. This domain includes the following service areas:

**a. Modeling/Classification Services.** This service provides customers with the ability to model and classify data they produce, acquire, or synthesize so that information about the data is adequately identified to facilitate its use within the information life cycle. This service includes associating model attributes with security policy attributes for security policy enforcement.

**b. Creation/Collection Services.** This service provides customers with the ability to associate data they produce, acquire, or synthesize with meta-models to create information. This service also uses the "Storage/Archival Services" to persist the data over time.

**c. Search/Query Services.** This service provides customers with the ability to discover data based

on its meta-models, meta-data, and/or the content of the data itself. It includes the enforcement of discovery based on security policies.

**d. Access/Sharing Services.** This service provides customers with the ability to access/retrieve, transform, and/or share data. This service includes the optimization of information delivery. It also includes the enforcement of security policies on the use of information.

**e. Storage/Archiving Services.** This service provides customers the ability to effectively and efficiently persist data over time. It works with the Access/Sharing Services to ensure that data delivery is optimized. This service includes the physical security required to protect data and the enforcement of security policies on "data at rest."

**f. Management/QA Services.** This service provides customers with full information life-cycle management services. It includes determining the appropriate storage mechanisms, locations, controls, etc., over time. It provides audits of information provenance and management to ensure that information is "fit" for use.

## B.6 Security

**Security.** The Security Architecture and Services Domain encompass all of the enterprise services necessary to assure secure computing and information exchange. The scope encompasses the development of a security specific architecture and supporting services that integrate and optimize the standards, policies, procedures, people, processes, and technology necessary to achieve an effective and efficient enterprise services environment. To accomplish that objective, the Security Architecture and Services Domain are dependent on the services of the other architecture and services domains in order to implement its specific scope. This domain includes the following service areas:

**a. Policy Management Services.** Policy management services provide the interface between security-policy decision makers and the infrastructure layers. Policies themselves reside in policy management authorities (PMAs) to make decisions-guided by security policy-about what to do in specific circumstances. Decisions are based on security policy and information about the current situation. Policy management services cause policy enforcement to occur in PEPs that exist within the infrastructure layers.

**b. Identity Services.** Identity services provide controls based on the identity attributes of subjects. For example, a user ID and password (or stronger authentication method) are normally required to access various repositories and applications within the infrastructure layers. Identity services involve a complex set of interacting mechanisms, including Policy Enforcement Points and Policy Decision Points, for authentication and authorization. Identity services are part of the overarching identity management functions of every enterprise.

**c. Audit Services.** Audit services collect and preserve data from sensors and provide select historical data to various recipients, including auditors and other security-related systems.

**d. Detection and Response Services.** Detection and response services receive data on the security state of the infrastructure layers from sensors and take actions, such as generating alerts with metrics of various sorts identifying severity, urgency, relevance, and criticality. Detection and response services may also take action (i.e., a response) through actuators to mitigate the event or to change the behavior of an infrastructure component.



**e. Security Management Services.** Security management services employ actuators to set configurations in various controls within the infrastructure layers. Security management services store security state data and produce actuator output to trigger security-related actions.

**f. Security Enterprise Architecture Vision.** NASA's IT security environment will enable collaborative interactions among all people who are participating in fulfilling NASA's mission while inherently protecting NASA assets. NASA's IT security infrastructure will support an efficient and adaptive risk managed framework. The infrastructure will enable seamless and location independent access to Agency resources. It will provide stakeholders with the tools, resources, and awareness they need to identify and manage risks. The framework will allow system owners to apply security controls commensurate with mission needs, information value, and associated threats.

# Appendix C: References

44 U.S.C. 3601 et seq., E-Government Act of 2002: Management and Promotion of Electronic Government Services, as amended

Information Resources Management (IRM) Strategic Plan

NPD 1000.5A - Policy for NASA Acquisition

NPD 1001.0 - NASA Strategic Plan

NPD 2830.1 - NASA Enterprise Architecture

NPR 1441.1 - NASA Records Retention Schedules

NPR 2800.1B - Managing Information Technology

NPR 7120.4D - NASA Engineering and Program/Project Management Policy

NPR 7120.5E - NASA Space Flight Program and Project Management Requirements w/Changes 1-10

NPR 7120.7/NID 7120.99 - NASA Information Technology and Institutional Infrastructure Program and Project Management Requirements

NPR 7120.8 - NASA Research and Technology Program and Project Management Requirements (w/change 3 dated 04/18/13)

NPR 8000.4A - Agency Risk Management Procedural Requirements

NPR 9420.1 - NASA Budget Formulation

OMB Circular A-11 - Preparation, Submission, and Execution of the Budget

OMB Circular A-130 Revised - Management of Federal Information Resources

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